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NOTES ON GEOGRAPHIC DISTRIBUTION

Distribution extension for *Leposoma rugiceps* (Cope, 1869) (Squamata: Gymnophthalmidae) in Panama, with first record from Bocas del Toro Province

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ABSTRACT: Reporting on the first locality in Bocas del Toro province of extreme western Panama, we extend the known geographic distribution of the lizard *Leposoma rugiceps* (Cope, 1869) about 275 km westwards from the nearest locality in Panamá province. We provide photos of Panamanian specimens, comment on their morphology, and map the distribution of this binational endemism.

The gymnophthalmid genus *Leposoma* Spix comprises small lizards that inhabit the leaf litter of tropical forests. Among the 16 species currently recognized within this genus of primarily South American distribution, only two are known to occur in Lower Central America (Köhler 2008; Pellegrino *et al.* 2011; Uetz 2011): *Leposoma southi* Ruthven and Gaige, 1924, and *L. rugiceps* (Cope, 1869). The latter species was described as *Loxopholis rugiceps* from "the Magdalena River region, New Grenada" (*i.e.,* present day Colombia; Figure 1, locality 1). Later, Peters (1880) described *Leposoma dispar* from "Caceres am Cauca, Neu-Granada" (*i.e.,* Caceres at the Cauca river, Colombia; Figure 1, locality 2). Ruibal (1952) included Cope's genus *Loxopholis* in *Leposoma* Spix, and placed *dispar* in the synonymy of *rugiceps,* creating the new combination *Leposoma rugiceps.* The species is known from Colombia and central Panama (Köhler 2008; Arredondo 2010; Pellegrino *et al.* 2011; Uetz 2011). During recent field work in Bocas del Toro province of extreme western Panama, we encountered specimens of *L. rugiceps* at a locality far from the species' documented range.

Between 24 and 29 November 2009, we carried out baseline inventory work within the San San Pond Sak Wetland of International Importance (Ramsar site no. 611). Around 22:30 h. on 24 November 2009, AH, RDL, and SL collected two specimens of *Leposoma rugiceps* (SMF 90192 and MHCH 2340; Figure 2A–D) close to the facilities of the Asociación de Amigos y Vecinos de la Costa y de la Naturaleza (AAMVECONA) at Centro Boca San San (09°31'33" N, 82°30'36" W, 1 m asl; Figure 1, locality 7; Figure 3A, E–G), on the narrow peninsula east of the mouth of the San San river, located approximately one km from the latter and about 9 km north of the town center of Changuinola, Corregimiento de Changuinola, Distrito de Changuinola, Provincia de Bocas del Toro, Panama.

The specimens were encountered just east of Centro Boca San San among leaf litter and debris within coastal vegetation including *Cocos nucifera, Anacardium occidentale,* stands of manioc and sugar cane, with *Rhizophora mangle* and *Avicennia germinans* towards the river, and *Coccoloba uvifera* towards the beach (Figure 3E–G). At the time of collecting, *Leposoma rugiceps* appeared extremely abundant at this site, individuals dashing off from virtually every step we took. In daylight, not a single individual was seen.

During the same survey period, we collected two specimens of *Leposoma southi* (SMF 90193, shown in Figure 2E–G, and MHCH 2341), and observed others, on the northern banks of Río Negro (09°30'29" N, 82°31'44" W; Figure 3A–D). This locality is only 2.8 km southwest of Boca San San, but exhibits a completely different habitat in the form of a mostly flooded river swamp forest dominated by Sangruillo (*Pterocarpus officinalis*) and Matomba (*Rhaphia taedigera*), bordered by a narrow strip of mangrove towards the river.

All specimens were encountered during opportunistic searches and caught by hand. The day after capture, they were preserved after euthanasia by pericardial injection of T61 (Intervet). The collecting permit SC/A-28-09 and the corresponding export permits were issued by the Dirección de Áreas Protegidas y Vida Silvestre of the Autoridad Nacional del Ambiente (ANAM), Panama City, Panama. The specimens have been deposited in the collection of the Senckenberg Forschungsinstitut Frankfurt, Germany (SMF 90192, 90193), and in the Museo Herpetológico de Chiriquí (MHCH 2340, 2341), Universidad Autónoma de Chiriquí, Davíd, Chiriquí, Panama. Species identification was carried out employing the keys, figures, and descriptions provided by Ruibal (1952), Uzzell and Barry (1971), and Köhler (2008). The capitalized colors and color codes (the latter in parentheses) provided for referenced specimens follow those of Smithe (1975–1981). Coordinates and elevation were recorded in the field using Garmin GPS receivers with built-in altimeters. All coordinates are in WGS 1984 datum. For distributional records of *Leposoma rugiceps,* we consulted relevant literature and directly

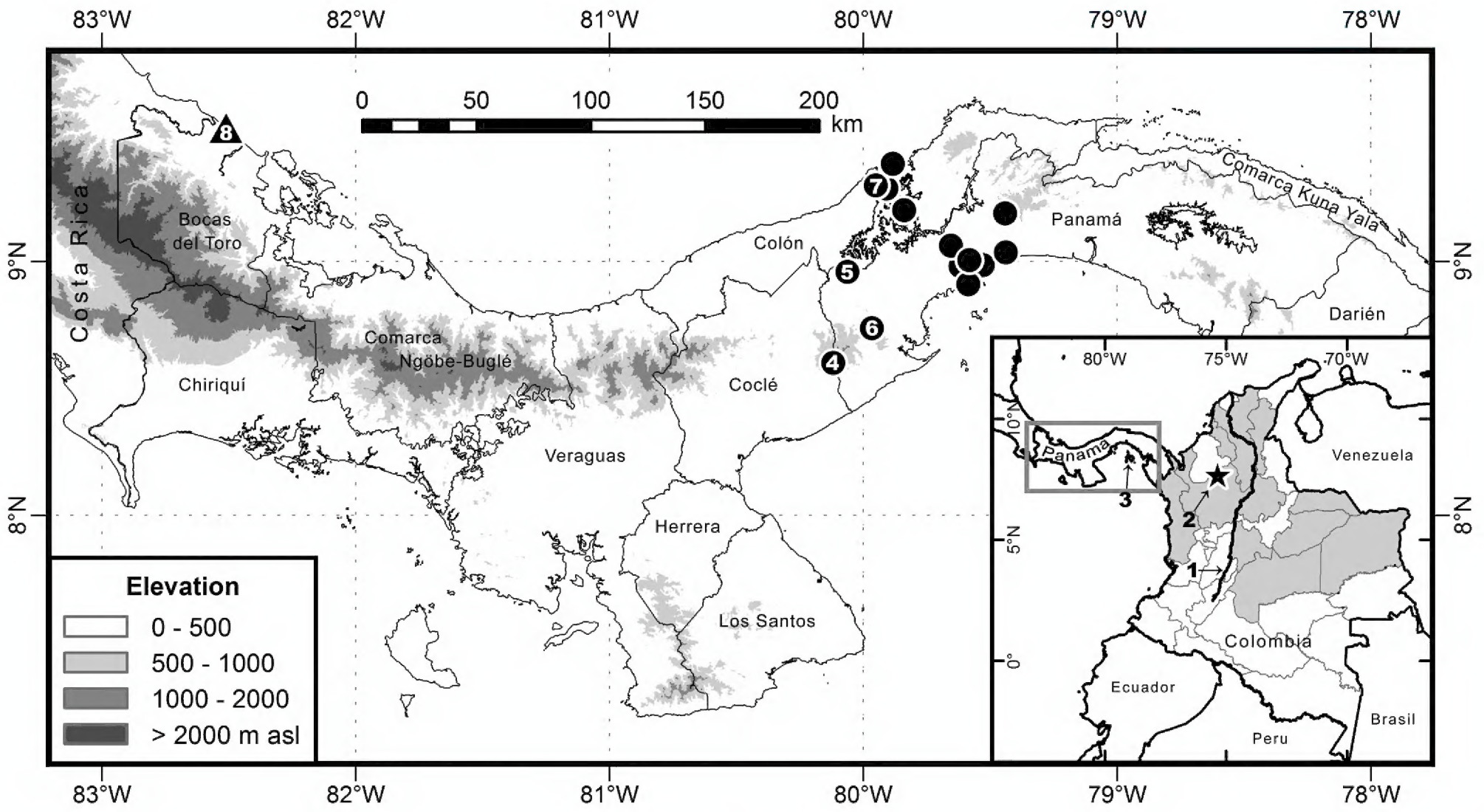

Figure 1. Distribution map for *Leposoma rugiceps*. In Colombia (inset), Departments from which *L. rugiceps* has been reported are shaded gray. In Panama (main map), circles represent records from literature and databases, the triangle the new locality reported herein. Numbered localities are: (1) the black line represents the Magdalena river (type locality fide Cope 1869); (2) the star indicates Caceres (type locality fide Peters 1880); (3) Archipiélago de las Perlas; (4) Valle de Antón; (5) Cirí; (6) Altos de Campana; (7) Sherman; (8) Boca San San.

searched the catalogues of the Museo de Vertebrados de la Universidad de Panama (MVUP) and SMF. Additional data were obtained from records held in different institutions and accessed through the HerpNET data portal (http://www.herpnet.org) on 03 November 2011. Their collection acronyms follow Sabaj Pérez (2010).

Our specimens from San San Pond Sak agree well with the descriptions mentioned above, exhibiting all the key characteristics mentioned therein. The coloration in life of a female (SMF 90192, Figures 2B–D) was recorded as follows: Dorsal ground color Army Brown (219B), grading into Cinnamon-Drab (219C) ventrolaterally; two broad, diffuse Sepia (119) paravertebral stripes originating on neck and fusing on tail; a diffuse, broad Sepia (119) dorsolateral stripe extending from neck onto tail; dorsal and lateral surfaces of regenerated part of tail Sepia (219), with but a slight suggestion of the extension of the Sepia (119) stripes mentioned above; flanks mottled with Sepia (119); dorsal surface of head very densely mottled with Sepia (119); lips Pearl Gray (81) with Sepia (119) vertical bars; ventral surface of head Pearl Gray (81) with a suggestion of dirty white; ventral surfaces of body, tail and limbs Drab-Gray (119D), those of regenerated part of tail Glaucous (80); iris Cinnamon (123A).

The distribution of *Leposoma rugiceps* is summarized in Figure 1. Within Colombia (inset), *L. rugiceps* has been reported from the northern Departments of Antioquia, Bolívar, Cesar, Chocó, Cundinamarca, Magdalena, Santander, and Sucre (Peters 1880; Ruibal 1952; Gutierrez and Arredondo 2007; Moreno-Arias *et al.* 2008; Arredondo 2010; ANSP; FMNH; LACM; MCZ). It is also present in the Colombian Guayana comprising the east-central Departments Arauca, Casanare, Vichada, and Meta (Avila-Pires 2005). We were unable to trace any locality record from eastern Panama (Darién Province, Comarcas Emberá and Kuna Yala), but numerous records exist from Colón and Panamá provinces in central Panama (Ruibal 1952; Telford 1971; Ibañez *et al.* 1995; 1996; 1997; ANSP; CM; FLMNH; FMNH; KU; MCZ; USNM). Most of these records come from the immediate surroundings of the Panama Canal in the former Canal Zone and Panama City. Köhler (2008: p. 90, Figure 173) depicts an individual from the "Pearl Islands, Panama" (Archipiélago de las Perlas, Panamá province) located in the Pacific Ocean approximately 08°30' N, 79° W (Figure 1, locality 3). The westernmost localities for *L. rugiceps* are at approximately 80° W, at Valle de Antón (Figure 1, locality 4) in Coclé province, Cirí (locality 5) and Parque Nacional Altos de Campana (locality 6) in Panamá province, and Sherman (locality 7) in Colón province (Dunn 1933; Ibañez *et al.* 1996; 1997 "1995").

Boca San San is by far the westernmost locality ever reported for *Leposoma rugiceps.* Our record extends the species' distributional range in a west-northwesterly direction, approximately 275 km from Cirí, 280 km from each Valle de Antón and Sherman, and 290 km from Altos de Campana. It seems logical that *L. rugiceps* should also be present in the intervening area, namely the Comarca Ngöbe-Buglé and Veraguas province. Since Boca San San is situated about five km from the border of Costa Rica, we strongly suspect that yet another addition to the fauna list of that country awaits discovery.

Given the abundance of *Leposoma rugiceps* in the coastal vegetation at Boca San San, it seems surprising that this species has never been reported between this locality and central Panama – especially along the coast and on the islands of Bocas del Toro, where similar habitats abound, and considerable sampling has taken place. Instead, all records of *Leposoma* between western Colón province

and the Río San San are of *L. southi.* We can only guess whether, throughout this distributional gap, *L. rugiceps* (a) is completely absent, (b) is present but has never been collected, or (c) has been collected, but misidentified as *L. southi.* Assuming that the population at Boca San San is autochthonous, possibility (a) seems highly unlikely, given the presence of suitable habitat throughout most, if not all, of the region. However, it cannot be completely ruled out that the population of *L. rugiceps* found at San San Pond Sak might have been introduced, possibly from Colón, since in one case a specimen has even reached the USA in this fashion (MCZ R-93421, "found on bananas shipped

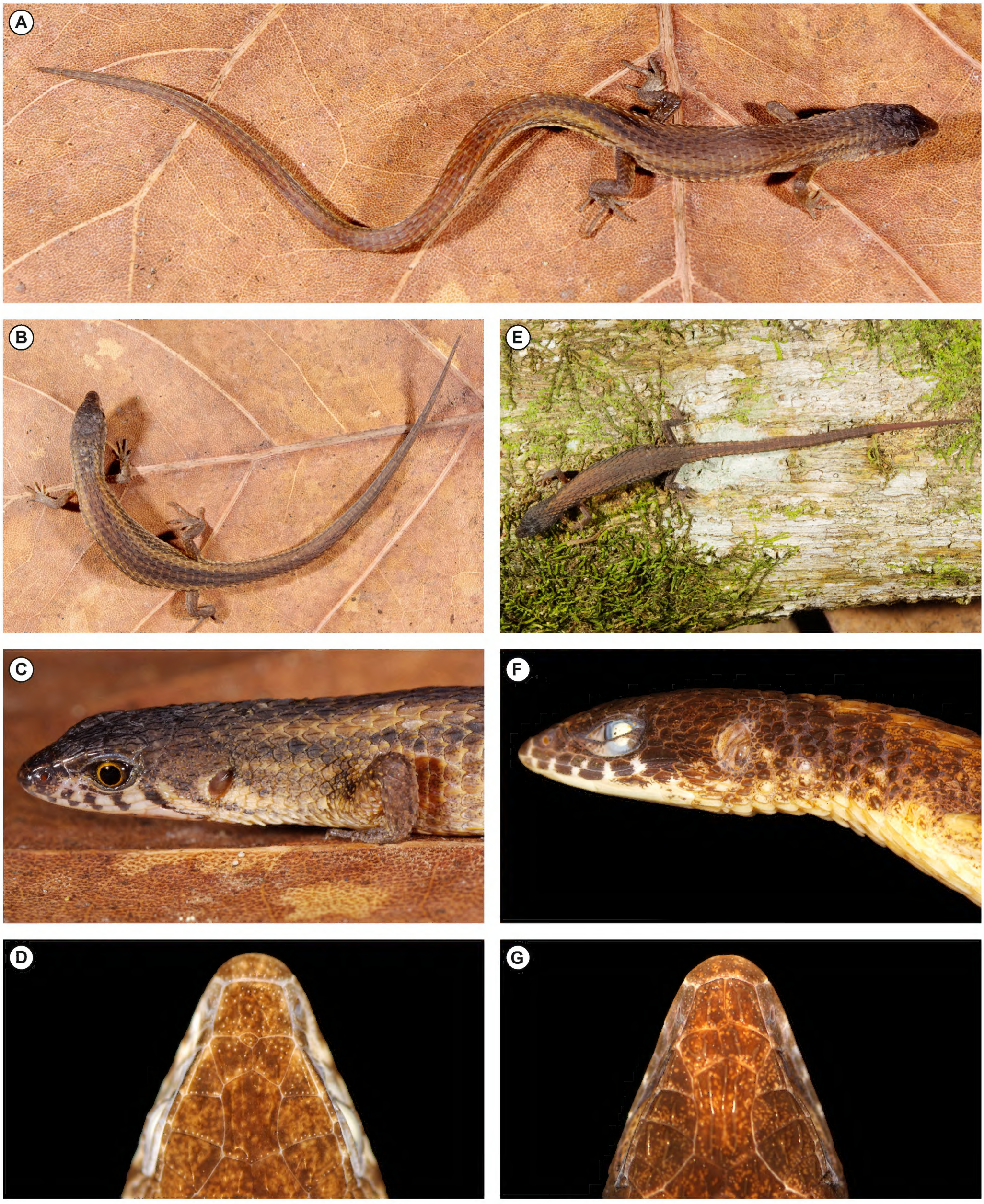

Figure 2. Individuals of *Leposoma* from San San Pond Sak. (A–D) *L. rugiceps*: (A) MHCH 2340; (B) entire specimen, (C) close-up of head and neck, and (D) dorsal view of snout showing single frontonasal plate of SMF 90192; (E–G) *L. southi*: (E) entire specimen, (F) close-up of head and neck, and (G) dorsal view of snout showing divided frontonasal plate of SMF 90193.

from Panama"). The species' presence on the Pearl Islands (Köhler 2008) constitutes another case of successful overwater dispersal, be it natural or anthropogenic. Possibility (b) could be explained by the two congeners exhibiting different habitat preferences. Although they have been reported to occur in sympatry (Ibañez *et al.* 1995; 1996) or even syntopy (Gutierrez and Arredondo 2007) at certain sites, our observations suggest that the two species inhabit different environments at San San Pond Sak. Not a single *L. southi* was found along the sandy

Figure 3. Habitats of *Leposoma* at San San Pond Sak. (A) satellite image showing the collection localities (X) for *L. rugiceps* and *L. southi* at San San Pond Sak; (B–D) north bank of Río Negro where *L. southi* occurs: (B) view of Sangruillo forest with narrow strip of mangrove in the left; (C) roots of Rhizophora close to the river (D) roots of Sangruillo inside the forest; (E–F) coastal vegetation around Boca San San where *L. rugiceps* occurs: (E) view from the Río San San onto Centro Boca San San; (F) view east along the peninsula from the Centro; (G) manioc and sugar cane in the shrub layer.

coastal strip at Boca San San, and no *L. rugiceps* in the swamp forest at Río Negro, indicating a sympatric, but not syntopic occurrence of the two species. However, since our surveys were of short duration and our samples are small, additional sampling is required to reliably assess this pattern of presumed ecological separation. Possibility (c) cannot be ruled out completely, although the species are distinguishable morphologically. The most conspicuous differences are the frontonasal plate (single in *L. rugiceps,* divided in *L. southi;* Figures 2D, G) and the lateral neck scales between ear opening and shoulder (imbricate and keeled, resembling the dorsals in *L. rugiceps;* non-imbricate and conical in *L. southi;* Figures 2C, F). However, the two species are very similar at first glance (Figures 2A, B, and E), so an occasional *L. rugiceps* might have been included in a series of *L. southi.* This requires reexamination of existing collections of *L. southi* as well as targeted sampling for *L. rugiceps,* preferably focussing on coastal vegetation, in Bocas del Toro and Veraguas provinces and the Comarca Ngöbe-Buglé.

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